

Canine Influenza Virus: Fact or Fiction?

An expert breaks down what you need to know

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The H1N1 virus has been making headlines for nearly a year, yet there is still much confusion about the reality of the situation. Reports that use words like “outbreak” and “emerging disease” often incite fear and leave us gripped by overly active imaginations. Picturing imminent world collapse, we forget to take the time to study available information, separate fact from fiction, and follow a reasonable course of action.

In the veterinary and sheltering worlds, there are parallels in the reaction to the spread of canine influenza virus (CIV), which was first identified and made headlines in 2004.

Recently, CIV has been back in the spotlight following conditional licensure and release of the first canine influenza vaccine. Many questions—*How effective is the vaccine? Should we test our animals? How concerned should we be?*—have been circulating in the animal sheltering community. It seems an ideal time for those of us concerned about the health and welfare of dogs to refresh ourselves with available information, determine a reasonable action plan related to canine influenza virus, and separate fact from fiction.

Fact: When dealing with “kennel cough” in a shelter dog or a whole population of dogs, CIV is one of many possible causes to consider.

Canine infectious respiratory disease complex, or “kennel cough,” is a common syndrome—especially in shelter dogs. Most humane facilities that house populations of dogs manage cases of infectious cough on a daily basis. The primary agents associated with the kennel cough syndrome include bacterial and viral pathogens, such as *Bordetella bronchiseptica*, *Mycoplasma* species, canine distemper virus, canine parainfluenza virus, and canine adenovirus-2. Each of these agents can cause similar clinical signs, including sudden onset of fever, loss of appetite, cough, and nasal discharge.



There is no way to prevent canine influenza virus so far, but it's possible for shelters to limit the consequences of widespread disease and contribute to an improved understanding of how the virus transmits, persists, and can be prevented.

In early 2004, an influenza A virus was recovered from the lung tissue of a racing greyhound who had succumbed to severe respiratory disease in Florida. Analysis of the viral genome revealed that the isolate was closely related to an equine H3N8 influenza virus. Since 2004, thousands of CIV cases and confirmed outbreaks have been reported in more than 25 states and the District of Columbia, according to Cornell University's Animal Health Diagnostic Center webpage (diaglab.vet.cornell.edu/issues/civ-stat.asp).

The total number of CIV cases that have occurred is not known. However, a recent one-year study, conducted by real-time polymerase chain reaction (PCR) testing at

Colorado State University, found dogs shedding the CIV virus in 11 out of 16 shelters (69 percent) that were experiencing outbreaks of canine respiratory disease.

CIV is clearly an important new differential diagnosis for any dog with acute respiratory disease.

Fiction: Canine influenza is really only a problem in animal shelters.

Dogs of any age, breed, and health status are susceptible to canine influenza if they have not had previous exposure to the virus. Like influenza viruses that affect other species, CIV is easily transmitted in cough and sneeze droplets and can be transmitted through fomites (hands, clothing, and other objects that



Laboratory diagnosis is required to distinguish canine influenza from other causes of acute respiratory disease. Here, a veterinarian acquires a nasal swab from a dog to submit for polymerase chain reaction (PCR) testing.



This photo was taken in a shelter where a high rate of canine infectious respiratory disease was affecting the dog population. Nearly every dog had been placed on antimicrobials, which is not a recommended practice.

can be contaminated with disease agents and act to spread the disease).

That said, the risk of infection is lowest for pet dogs who have little exposure to other dogs or dog facilities, and greatest for dogs who are housed in group environments or have frequent contact with other dogs, such as through boarding kennels, day cares, dog parks, veterinary hospitals, and shelters.

CIV does not spontaneously erupt in facilities; initial cases have to enter from community sources to start the cycle of infection, reflecting a community problem.

The virus does not survive long in the environment (it can remain viable on surfaces for 48 hours, on clothing for 24 hours, and on hands for 12 hours) and is easily killed with routine cleaning and disinfection, but many facilities do struggle to break the cycle of transmission once the virus is introduced. There is still much that remains to be studied about how this virus circulates, persists, and evolves in the dog population—both in owned and in homeless animals.

Fiction: Dogs with CIV frequently die rapidly, with signs of hemorrhagic pneumonia.

Initial reports indicated that canine influenza virus caused significant mortality in affected dogs. But it now appears that the disease behaves like influenza infections in many other species. Most dogs will recover without serious complications.

Following infection, the virus replicates quickly in dogs' respiratory tract cells. There is a two-to-five-day period during which nonspecific clinical signs (such as fever and lethargy) occur. It is during this early incubation period that peak nasal viral shedding occurs. Around days five to seven, more visible clinical signs of cough and nasal discharge develop. Typically, viral shedding wanes by days seven to 10, but that can vary in individual dogs.

It is important to note that by the time obvious clinical signs develop, the period when animals are most infectious often has already passed. In many facilities where animals are isolated only after clinical signs are noticed, infection control becomes a significant challenge because viral shedding and transmission to other dogs has already occurred. The majority of affected dogs (80-90 percent) will show mild to no clinical signs, while a smaller percentage of dogs (10-20 percent) may develop more severe illness characterized by high fever, lethargy, rapid breathing, and secondary bacterial bronchopneumonia.

In uncomplicated cases, the respiratory tract may begin to heal in as little as three to five days following infection. In other cases, cell damage may predispose animals to acquiring secondary bacterial infections, and

recovery may take several weeks. Rarely, severe to fatal disease may occur. Thus CIV is a disease that causes a high morbidity (many affected), but a relatively low mortality (death rate) when appropriately diagnosed and managed.

Fiction: Outbreaks of CIV are easily recognized in a facility or population of dogs.

Much focus has been placed on outbreak recognition and management. When CIV first enters a group of susceptible dogs, a presumptive diagnosis may be made based on the rapid spread of an acute respiratory disease accompanied by fever that is unrelated to vaccine history and associated with a prolonged or complete lack of response to therapies that are generally effective for other causes of canine infectious respiratory disease.

Laboratory diagnosis is still required to differentiate CIV from other causes of acute respiratory disease, but the rapid spread can be suggestive. However, when CIV enters facilities where kennel cough is already occurring, it may not be immediately recognized as anything "new," but instead may appear to be a gradual worsening of the existing problem. In these situations, failure to perform rapid and appropriate diagnostic testing—and to offer timely treatment specifically designed to treat the disease—can lead to decline in the welfare and health of the entire population. Therefore, in a population of dogs showing an increase in the number of acute respiratory disease cases, overall severity of illness, or a prolonged to complete lack of response to usually effective therapies, CIV should be a consideration, and diagnostics should be pursued.

Fiction: CIV can be diagnosed based on clinical signs alone.

Laboratory diagnosis is required to distinguish canine influenza from other causes of acute respiratory disease. There are multiple diagnostic methods available for testing; each has strengths and weaknesses.

"Too often, facilities test only one or two dogs using only one test method, and the diagnosis is missed," says Gabriele Landolt, a virologist who is researching canine influenza in animal shelters through a Morris Animal Foundation grant. "To identify the causative

agent accurately and rapidly, thus allowing to institute optimal control measures, it may be necessary to combine several diagnostic tests and test multiple dogs in varying stages of disease.”

The timing of sample collection relative to when an animal was infected relates directly to test performance. Some tests, like PCR analysis and other methods aimed at detecting the virus, are designed to work during the first few days following infection, when dogs are shedding infectious virus but showing few clinical signs. These tests are preferred for an early clinical infection.

Other tests, like serology (blood tests), measure exposure to the virus through antibody levels, which do not develop until at least seven days following infection (or potentially, following vaccination). A comparison of serum samples taken two weeks apart is recommended to document recent exposure through a fourfold increase in the levels of antibodies.

In a population of dogs, the odds of capturing a positive sample increase by collecting samples from multiple animals (five to 10

dogs are recommended) who have entered the facility at various times and are exhibiting different clinical signs. For more information on testing methods, read the chapter on canine influenza in the newly available textbook, *Infectious Disease Management in Animal Shelters*.

Fiction: Doxycycline is a good standard antibiotic for all dogs with CIV.

Not all dogs affected by CIV will require therapeutic intervention. When medication does become necessary, there is no single correct treatment. For many CIV cases, supportive care may be all that is required. Good nutrition, maintenance of hydration, and minimization of stress are still critical components of therapy even when medication is in use.

Dogs who show signs of secondary bacterial infections (e.g. mucoid nasal discharge, productive cough, or pneumonia) should be treated with broad-spectrum antibiotics. Ideally, antibiotics should be chosen on the basis of culture and sensitivity. Until culture and sensitivity results become available,

broad-spectrum therapy is recommended to cover most of the likely secondary pathogens.

Cough suppressants are not recommended for CIV dogs experiencing productive coughs. Some practitioners report anecdotal response to a single anti-inflammatory dose of glucocorticoids, but this is not documented well and not without risk.

Antiviral medications specifically aimed at influenza infections are available, but not advocated for use with CIV for several reasons. These drugs must be given very early in the infection for effect, there are no recommended dosing strategies, there are no efficacy or safety studies available in dogs, and the virus may develop resistance to these drugs. Furthermore, they are expensive medications that—especially these days—are often being conserved for use in humans.

In severe cases of secondary pneumonia, oxygen therapy, nebulization, and bronchodilator therapy may be helpful. However, such intensive therapy can be difficult to provide on a large scale, and if dogs are severely affected and intensive care is not available, euthanasia may become necessary for herd welfare reasons.



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Fact: A facility can break the cycle of transmission.

Ultimately, widespread or uncontrolled respiratory disease can affect an entire community. When CIV is confirmed in a facility, management decisions must be made to limit its impact, but CIV is difficult to control in most populations of dogs for several reasons. The virus spreads rapidly through the dog population, in part through sneeze droplets that can be difficult to contain. While some infectious dogs may show obvious clinical signs, others are asymptomatic, yet shedding infectious agent.

Because of the ease of transmission, an entire facility—not just the animals with clinical signs—is considered exposed at the time of diagnosis. Ideally, dogs with clinical signs should be isolated away from exposed dogs, who are placed in a CIV quarantine area to watch for development of symptoms—but this is not always practical with a CIV quarantine.

In order to break the cycle of infection, the exposed dog population needs to be contained (no new dogs in and no dogs out) for the duration of viral shedding. A 14-day quarantine is recommended. Many dogs will remain symptomatic well beyond the time they are no longer shedding virus.

Shelters and other facilities can achieve a quarantine in several ways. The simplest way to end a CIV outbreak is to stop admitting any new dogs for a two-week period. However, this may not be a possibility for all facilities, and where it isn't, new dogs can be separated from exposed dogs by using a temporary offsite facility (for either population) for two weeks. In small programs, foster homes and rescue groups can be used during the period.

Finally, some shelters have successfully continued to admit new dogs by strictly separating new intakes from the exposed dogs. This may mean that the exposed dogs must be moved and/or grouped in a physical area of the building distant from where new dogs enter. Ideally, the two areas should have separate ventilation systems, but at minimum there should be physical barriers (such as closed doors) to lessen aerosol transmission.

As with any infectious disease, biosecurity measures are important. Suggestions include designating specific staff to care for the un-

exposed dogs, but if this is not possible, staff should care for the unexposed dogs first.

Measures that reduce fomite transmission should be in place, including frequent hand washing, use of personal protective equipment like disposable gloves, cover-up gowns and boots, and protocols that encourage following “all-in, all-out” procedures (meaning that a staffer should enter with all necessary supplies, perform their tasks in the area, and then exit, rather than going back and forth into the area and increasing the chances of contamination).

Though its effectiveness is controversial, the use of regularly changed footbaths or disinfectant mats outside of quarantined areas is unlikely to do harm and may serve as a reminder to staff of other necessary biosecurity measures.

Fiction: The H3N8 Vaccine is considered a core shelter vaccine.

When weighing whether the new H3N8 CIV vaccine will benefit shelters, there are a number of things to consider.

Vaccines are an important part of influenza control in all species, and the development and conditional approval of a vaccine for canine influenza is an important step toward better management of canine influenza virus. But before shelters put a new product into widespread use, they should consider information about the product, how it works, and the potential risks and benefits.

It is also important to recognize that whenever a new vaccine is conditionally released, there are often many factors yet to be researched. “Some of the currently unknown aspects of the H3N8 vaccine include the maximum duration of immunity induced by the vaccine, whether there is benefit in vaccinating around the time of exposure, and whether evolution of field strains of the canine influenza virus might make the vaccine ineffective over time,” says Melissa Kennedy, a clinical virologist at the University of Tennessee College of Veterinary Medicine.


Shelters also must consider that the vaccine is an inactivated product. It is labeled to be given as two doses spread two to three weeks apart to healthy dogs 6 weeks or older. This means that it can take weeks for a dog to respond maximally to the vaccine, and so

shelters that house dogs long term may benefit more than those with short turnover times.

The only available efficacy studies by the vaccine company demonstrate that use of the product lessens clinical signs of disease and decreases—but does not eliminate—virus shedding. Influenza vaccines used in many species have similar effects; vaccinated dogs can still become infected and shed virus, but may not become as clinically affected and may not infect other dogs as readily. This vaccine has been termed a “lifestyle vaccine,” much like available vaccines for *Bordetella bronchiseptica*. The best use of the vaccine appears to be for preemptive vaccination of dogs at high risk of exposure to CIV.

The Last Word

Much like the present situation with H1N1, canine influenza virus—although a serious issue for shelters—is certainly not grounds for panic. The recent identification of H1N1 in a cat, and apparent transmission of H1N1 from humans to other animals, serves as a reminder that influenza viruses are notoriously unpredictable and require vigilant monitoring.

Cats do not appear to present a significant risk for viral transmission of H1N1, and the canine influenza H3N8 virus seems to transmit primarily dog-to-dog with minimal zoonotic risk, but much remains unknown about both of these viruses. Thus far, there is no way to prevent CIV, but it is possible for shelters to limit the consequences of widespread disease and contribute to an improved understanding of how the virus transmits, persists, and can be prevented through standard infection-control measures, diagnostic testing, separation of affected animals, appropriate therapy, and proactive community education. 

Miranda Spindel is the director of veterinary outreach at the ASPCA and past president of the Association of Shelter Veterinarians. She initiated and completed the first residency in shelter medicine offered through Colorado State University and founded the CSU student chapter of the Association of Shelter Veterinarians.